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Attorney Docket No. COVA0003 DIV  
Client/Matter No. 90337.0006.001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Klaus Dimmler, Alfred P. Gnadinger

Serial No. -----

Filed: Herewith

For: FERROELECTRIC TRANSISTOR WITH  
ENHANCED DATA RETENTION

Customer No. 25235

Group Art Unit:

Examiner:

Confirmation No.:

INFORMATION DISCLOSURE STATEMENT  
UNDER 37 C.F.R. 1.97

Commissioner for Patents  
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Sir:

Pursuant to 37 C.F.R. § 1.97, the Examiner may wish to consider the references listed on the attached Form PTO/SB/08A. In submitting these references, no representation is made or implied that the references are or are not material to the examination of this application.

This Information Disclosure Statement is filed before mailing of a first Office Action in the above case. Accordingly, no fee is believed due. However, any fee associated herewith may be charged to Deposit Account No. 50-1123.

Date

7/15/03

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<b>PTO/SB/08A (10/01)</b> (Substitute for form 1449A/PTO)  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use several sheets if necessary)  Sheet <u>  1  </u> of <u>  5  </u>	<b>ATTY. DOCKET NO. COVA0003 DIV</b> Client/Matter No. 90337.0006.001	<b>APPLICATION NO.</b> -----
	<b>FIRST NAMED INVENTOR</b> Klaus Dimmler, Alfred P. Gnadinger	
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**U.S. PATENT DOCUMENTS**

Examiner Initials	Cite No.	Document No. No. – Kind Code	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Doc	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-3,832,700	08/27/1974	Wu et al.	
		US-4,860,254	08/22/1989	Pott et al.	
		US-5,060,191	10/22/1991	Nagasaki et al.	
		US-5,070,385	12/03/1991	Evans Jr. et al.	
		US-5,307,305	04/26/1994	Takasu	
		US-5,345,414	09/06/1994	Nakamura	
		US-5,541,871	07/30/1996	Nishimura et al.	
		US-5,541,873	07/30/1996	Nishimura et al.	
		US-5,563,081	10/08/1996	Ozawa	
		US-5,578,846	11/26/1996	Evans, Jr. et al.	
		US-5,621,681	04/15/1997	Moon	
		US-5,623,439	04/22/1997	Gotoh et al.	
		US-5,744,374	04/28/1998	Moon	
		US-5,768,185	06/16/1998	Nakamura et al.	
		US-5,822,239	10/13/1998	Ishihara et al.	
		US-6,236,076	05/22/2001	Arita et al.	
		US-6,246,602	06/12/2001	Nishimura	
		US-6,285,577	09/04/2001	Nakamura	
		US-6,335,550	01/01/2002	Miyoshi et al.	
		US-6,339,238	01/15/2002	Lim et al.	
		US-5,198,994	03/30/1993	Natori	
		US-5,302,842	04/12/1994	Chan	
		US-5,946,224	08/31/1999	Nishimura	
		US-6,069,381	05/30/2000	Black et al.	
		US-6,067,244	05/23/2000	Ma et al.	
		US-5,962,884	10/05/1999	Hsu et al.	
		US-6,144,579	11/07/2000	Taira	
		US-6,087,688	07/11/2000	Furuta et al.	

<b>PTO/SB/08A (10/01)</b> (Substitute for form 1449A/PTO)  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use several sheets if necessary)  Sheet <u>  2  </u> of <u>  5  </u>	<b>ATTY. DOCKET NO. COVA0003 DIV</b> Client/Matter No. 90337.0006.001	<b>APPLICATION NO.</b> _____
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**U.S. PATENT DOCUMENTS**

		US-6,151,241	11/21/2000	Hayashi et al.	
		US-6,310,373	10/30/2001	Azuma et al.	
		US-6,225,654	05/01/2001	Evans, Jr. et al.	
		US-6,091,621	07/18/2000	Wang et al.	
		US-5,146,299	09/08/1992	Lampe et al.	
		US-5,378,905	01/03/1995	Nakamura	
		US-5,515,311	05/07/1996	Mihara	
		US-5,998,819	12/07/1999	Yokoyama et al.	
		US-6,307,225	10/23/2001	Kijima et al.	
		US-5,541,870	07/30/1996	Mihara et al.	
		US-5,418,389	05/23/1995	Watanabe	
		US-5,877,977	03/02/1999	Essaian	
		US-6,319,542	11/20/01	Summerfelt et al.	
		US-6,245,451	06/12/01	Kamisawa et al.	
		US-6,362,068	03/26/02	Summerfelt et al.	
		US-5,887,117	03/23/99	Desu et al.	
		US-6,396,095	05/28/2002	Shimada et al.	
		US-6,396,093	05/28/2002	Nakamura	
		US-6,373,743	04/16/2002	Chen et al.	
		US-6,372,518	04/16/2002	Nasu et al.	
		US-6,370,056	04/09/2002	Chen et al.	
		US-6,365,927	04/02/2002	Cuchiaro et al.	
		US-6,326,315	12/04/2001	Uchiyama et al.	
		US-6,322,849	11/27/2001	Joshi et al.	
		US-6,255,121	07/03/2001	Arita et al.	
		US-6,245,580	06/12/2001	Solayappan et al.	
		US-6,225,656	05/01/2001	Cuchiaro et al.	
		US-6,225,156	05/01/2001	Cuchiaro et al.	
		US-6,207,465	03/27/2001	Cuchiaro et al.	
		US-6,201,731	03/13/2001	Kamp et al.	
		US-6,194,751	02/27/2001	Evans, Jr.	

<b>PTO/SB/08A (10/01)</b> (Substitute for form 1449A/PTO)  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use several sheets if necessary)  Sheet <u>  3  </u> of <u>  5  </u>	<b>ATTY. DOCKET NO. COVA0003 DIV</b> Client/Matter No. 90337.0006.001		<b>APPLICATION NO.</b> _____
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### U.S. PATENT DOCUMENTS

		US-6,171,934	01/09/2001	Joshi et al.	
		US-6,165,802	12/26/2000	Cuchiaro et al.	
		US-6,151,242	11/21/2000	Takashima	
		US-6,150,184	11/21/2000	Evans et al.	
		US-6,147,895	11/14/2000	Kamp	
		US-6,140,672	10/31/2000	Arita et al.	
		US-6,121,648	09/19/2000	Evans, Jr.	
		US-6,066,868	05/23/2000	Evans, Jr.	
		US-6,031,754	02/29/2000	Derbenwick et al.	
		US-6,027,947	02/22/2000	Evans et al.	
		US-6,025,735	02/15/2000	Gardner et al.	
		US-5,977,577	11/02/1999	Evans, Jr.	
		US-5,953,061	09/14/1999	Biegelsen et al.	
		US-5,872,739	02/16/1999	Womack	
		US-5,825,317	10/20/1998	Anderson et al.	
		US-5,808,676	09/15/1998	Biegelsen et al.	
		US-5,789,775	08/04/1998	Evans, Jr. et al.	
		US-5,757,042	05/26/1998	Evans, Jr. et al.	
		US-5,559,733	09/24/1996	McMillan et al.	
		US-5,536,672	07/16/1996	Miller et al.	
		US-5,523,964	06/04/1996	McMillan et al.	
		US-5,519,235	05/21/1996	Ramesh	
		US-5,479,317	12/26/1995	Ramesh	
		US-5,434,811	07/18/1995	Evans, Jr., et al.	
		US-5,384,729	01/24/1995	Sameshima	
		US-5,365,094	11/15/1994	Takasu	
		US-5,227,855	07/13/1993	Momose	
		US-5,046,043	09/03/1991	Miller et al.	
		US-6,307,225	10/23/2001	Kijima et al.	
		US-5,955,213	09/21/1999	Yano et al.	
		US-5,919,515	07/06/1999	Yano et al.	
		US-6,256,220	07/03/2001	Kamp	

<b>PTO/SB/08A (10/01)</b> (Substitute for form 1449A/PTO)  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use several sheets if necessary)  Sheet <u>4</u> of <u>5</u>	<b>ATTY. DOCKET NO. COVA0003 DIV</b> Client/Matter No. 90337.0006.001	<b>APPLICATION NO.</b> _____
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### U.S. PATENT DOCUMENTS

		US-5,886,920	03/23/1999	Marshall et al.	
		US-6,104,049	08/15/2000	Solayappan et al.	Figure 1
		US-5,739,563	04/14/1998	Kawakubo et al.	Figures 1-4F
		US-6,130,103	10/10/2000	Cuchiaro et al.	Entire document
		US-6,358,758	03/19/2002	Arita et al.	Entire document
		US-5,736,759	04/07/1998	Haushalter	Entire document
		US-6,469,334	10/22/2002	Arita et al.	Figure 1
		US-2002/0083959 A1	07/04/2002	Morita et al.	Paragraphs 108-134
		US-5,780,886	07/14/1998	Yamanobe et al.	Figures 1(A)-4(C)
		US-5,959,879	09/28/1999	Koo	Figures 2-4
		US-5,858,533	01/12/1999	Greuter et al.	
		US-			
		US-			
		US-			
		US-			
		US-			

### FOREIGN PATENT DOCUMENTS

Examiner Initials	Cite No.	Foreign Patent Doc cntry code - No. - Kind Code	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Doc	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear	TRANSLATION	
		JP 408055919 A	02/27/1996	Ogimoto et al.		YES	NO
		WO98/98/13300	02/04/1998	Kawamura			

### OTHER PRIOR ART - NON PATENT LITERATURE DOCUMENTS

Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s) publisher, city and/or country where published
		TOKUMITSU, EISUKE et al, "Characterization of MF(M)IS structures using P(L)ZT and Y <sub>2</sub> O <sub>3</sub> films", Jpn. J. of Appl.Phys., Vol 39, September 2000, pp. 5456-5459.
		TOKUMITSU, EISUKE et al, "Preparation of STN films by the sol-gel method for ferroelectric gate structures", IMF-10 Madrid/Spain (2001), pp. 105-110.

<b>PTO/SB/08A (10/01)</b> (Substitute for form 1449A/PTO)  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use several sheets if necessary)  Sheet <u>  5  </u> of <u>  5  </u>	<b>ATTY. DOCKET NO. COVA0003 DIV</b> Client/Matter No. 90337.0006.001	<b>APPLICATION NO.</b> _____
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<b>OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS</b>		
		TOKUMITSU, EISUKE et al, "Electrical Properties of MFIS and MFMIS FETs using ferroelectric SBT film and STO/SiON buffer layer", Jpn. J. of Appl.Phys., Vol 39, April 2000, pp. 2125-2130.
		SHIN, CHANG HO et al, "Fabrication and characterization of MFIS FET using Al <sub>2</sub> O <sub>3</sub> insulating layer for nonvolatile memory", ISIF 2001, 9 pages.
		LEE, HO NYUNG et al., "CV characteristics of Pt/SBT/CeO <sub>2</sub> /Si structure for non volatile memory devices", ISIF, 4 pages.
		CHOI, HOON SANG et al, "Crystal Structure and electrical properties of Pt/SBT/ZrO <sub>2</sub> /Si", J. of Korean Phys. Soc., vol. 39, No. 1, July 2001, pp. 179-183.
		LI, W.P. et al, "Improvement of MFS structures without buffer layers between Si and ferroelectric film", Applied Physics A, Springer (2000), pp. 85-87.
		HAN, JIN-PING et al, "Memory effects of SBT capacitors on silicon with silicon nitride buffer", Integrated Ferroelectrics, 1998, Vol. 22, pp.213-221.
		MILLER, S.L. and MCWHORTER, P.J., "Device Physics of the ferroelectric memory field effect transistor", ISIF June 1992, pp. 5999-6010.
		KALKUR, T.S., "Characteristics of MFS capacitors and MFSFETs with BaMgF <sub>4</sub> gate dielectrics", ISIF 1992, 1 page.
		WU, S.Y., IEEE Trans.Electron Devices ED 21, 499 (1974). An excellent review article referencing the same work was published in 1992 by SINHAROY, S. et al, "Integration of ferroelectric thin films into nonvolatile memories", J. Vac.Sci.Technol.A 10(4), Jul/Aug 1992, pp. 1554-1561.
		CHUNG, ILSUB et al., "Data Retention: Fabrication and characterization of MFISFET using CMOS process for single transistor memory applications", Integrated Ferroelectrics, 1999, Vol. 27, pp. 31-39.
		MILLER, S.L. and MCWHORTER, P.J., "Theoretical investigation of a ferroelectric transistor: Physics of the ferroelectric nonvolatile memory field effect transistor", J. Appl.Phys. 72 (12), September 9, 1992, pp. 5999-6010.
		SMYTH, D.M., "Charge Motion in ferroelectric thin films", Ferroelectrics, Vol.116, pp. 117-124 (1991), pp. 117-124.
		WU, S.Y. "A ferroelectric memory device, Metal-Ferroelectric-Semiconductor Transistor", IEEE Trans.Electron Devices, vol. ED-21, no. 8, August 1994, pp. 499-504.
		MOSHNAYAGA, V. et. al., "Preparation of rare-earth manganite-oxide thin films by metalorganic aerosol deposition technique", Appl. Phys. Lett., vol. 74, no. 19, pp 2842-2844 (1998).
		KIM, KWANG-HO, "Metal-Ferroelectric – Semiconductor (MFS) FET's using LiNbO <sub>3</sub> /Si (100) Structures for nonvolatile memory applications", IEEE Electron Device Letters, Vol. 19, No. 6, pp. 204-206 (June 1998).
<b>EXAMINER SIGNATURE</b>		<b>DATE CONSIDERED</b>
<b>EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.</b>		